



## **Glaucoma**

### **Introduction**

Glaucoma is an eye condition resulting from an increase of pressure in the eye. It is the second most common cause of blindness in the United States, and it affects approximately 3 million Americans. Many think that glaucoma only afflicts the elderly, but really it can affect all age groups.

### **What is it?**

Glaucoma is an eye disease that is caused by an increase in intraocular pressure (IOP) -- this pressure gives the eyeball its round shape. The increase in IOP results from a change in the eye's ability to drain aqueous humor, the fluid circulating inside the eye.

There are two general types of glaucoma - open-angle and closed-angle (the angle refers to the point where the muscles that keep open the pores that drain the fluid meet.) The most common type is open-angle glaucoma; it is the leading cause of blindness in people of African American descent. Normally, open-angle glaucoma is a slowly progressive (or chronic) disease that occurs in both eyes, although one eye may have a faster progression of the disease than the other. A smaller percentage of people develop closed-angle glaucoma, which is typically acute (occurs more suddenly) and associated with a red, swollen, and painful eye. It is usually the result of a blockage of the pores that drain eye fluid and should be treated emergently to remove the blockage to help avoid permanent vision loss.

### **What causes it?**

The rise in intraocular pressure (IOP) that causes glaucoma results when the eye is unable to correctly drain the aqueous humor, the fluid circulating inside the eyes. The inability of the eye to drain this fluid may be due to blockage or closure of the draining pores from swelling of the surrounding tissue, problems with the muscles that open the area around these pores, and trauma or scarring from other eye diseases. There is also a hereditary component to developing this eye disease. Some medications have been linked to either causing or worsening glaucoma, but these are not thought to be the main cause of the disease. Usually, the cause of glaucoma is unknown, although some types are due to trauma or other diseases.

To understand how this increased pressure affects the eye, think of your eye as a balloon. When there is too much air blown into a balloon, pressure builds, and the balloon wall thins. Similarly, the eye's walls become weaker and weaker as the pressure increases, especially where the optic nerve is located. The optic nerve carries visual information to the brain through more than 1 million nerve fibers. As the pressure builds, the optic nerve is damaged, causing vision loss.

### **Who has it?**

Glaucoma is a disease that affects all age groups. It typically occurs in people over the age of 50 years, but it can occur at any age. Up to 3 million Americans are afflicted with the disease, and it is the second leading cause of blindness in the world. Glaucoma occurs six to eight times more frequently in African-Americans than in other races, and it is the number one leading cause of blindness in African-Americans.

**What are the risk factors?**

Risk factors are characteristics that predispose people to developing a disease. Common risk factors for glaucoma are:

- Individuals over the age of 60
- Individuals with a family history of glaucoma
- African-Americans over the age of 40
- Individuals with diabetes, severe nearsightedness, long-term corticosteroid use, or a previous eye injury

**What are the symptoms?**

There are two types of glaucoma. The symptoms and the time to onset of the two types of the disease are very different.

Open-angle glaucoma is usually without symptoms. It is often painless and goes unnoticed until late in the disease when areas of peripheral vision are lost. If the peripheral vision continues to fade, tunnel vision may develop. If open angle glaucoma is not treated, the tunnel vision may progress into blindness. Screening performed during annual eye exams is extremely important in detecting this disease early so that treatment can be started

Closed-angle glaucoma differs from open-angle in that the symptoms typically occur suddenly (although not always). The symptoms may include blurred vision, formation of halos around lights at night, pain and redness in the eye, and swelling and clouding of the cornea (the typically clear and transparent coating layer of the outer eyeball). The pain experienced can be so intense that it may cause nausea and vomiting or a headache. Symptoms like this need to be evaluated in the emergency department as soon as possible to prevent permanent eye damage.

**How is it treated?**

Currently, there is no cure for glaucoma, but treatment can control the progression of the disease. The primary goal of treatment is to prevent further damage to the eye by lowering intraocular pressure (IOP) and to ultimately prevent blindness. Treatment of glaucoma may include medications, surgery, or a combination of medication and surgery.

For open angle glaucoma, topical eye medications (eyedrops, gels and ointments) are often used early in the disease followed by oral medications or surgery. Surgery is frequently used in individuals who do not experience adequate lowering of intraocular pressure by the medications or in individuals who experience unwanted side effects from using medications. For closed-angle glaucoma, laser surgery is often performed before a doctor prescribes medications. But, glaucoma medications may also be given after the surgery.

Topical beta-blocking eye medications are commonly used as initial therapy for the treatment of open-angle glaucoma. Additional agents may be added to the beta-blocker if the intraocular pressure (IOP) remains elevated. The choice of the second medication often depends on how well the drug is tolerated, how well it works, and its ease of use. It is important to know that it is possible to require up to four different topical medications to treat glaucoma.

There are several types of topical medications that are used for the treatment of glaucoma. These medications work to lower intraocular pressure (IOP) by either decreasing the amount of aqueous fluid the eye makes or by helping the aqueous fluid drain from the eye. The topical eyedrops, gels or ointment may cause burning, stinging, or redness when instilled into the eye, although these side effects are usually tolerable. If

you have problems using one topical eye medication, tell your doctor or pharmacist because using a different drug or dosage may be possible.

Medications can be taken by mouth when topical eye medications are not effective at controlling or reducing intraocular pressure (IOP). Medications by mouth may also be used alone or in combination with topical eye medications to lower the pressure. Oftentimes patients experience more side effects with the medications taken by mouth than with topical eye medications.

### **Helping Yourself**

Treating glaucoma involves proper use of your topical eye medications (i.e. eyedrops, gels, or ointments), which includes knowing the correct way to administer the topical eye medications as well as understanding the prescribed dose. To learn more about how to properly use your eyedrop, click here.

Using your medication exactly as directed is important to prevent loss of vision. Unwanted side effects may also result when your medication is not used as your health care provider has instructed.

Several medications can worsen glaucoma, therefore it is very important to inform your doctor or pharmacist of any prescription and nonprescription medications you are taking.

### **What is on the horizon?**

Although the present generation of medications for glaucoma can help control the disease, most have side effects, and none, so far, can provide a cure. As a result, research is ongoing, as scientists attempt to devise more effective tactics to fight the disease.

Researchers are trying to identify various tests, procedures and medications that may provide health care professionals with more information regarding the causes, treatment and prevention of glaucoma.

Currently, the New York Glaucoma Research Institute has several ongoing studies. The Institute is reviewing the use of ultrasound biomicroscopy (UBM), a procedure that researchers anticipate will provide for a more accurate diagnosis of glaucoma. Optical coherence tomography (OCT) is another procedure being studied. This procedure is being investigated to aid health care professionals to gain a better understanding of the development of glaucoma, as well as allow for earlier detection of the disease. Other areas of research include confocal scanning laser ophthalmoscopy and tissue culture, which will evaluate the optic nerve and provide insight into how to strengthen the optic nerve once affected by glaucoma.

There is a new interest in research targeting stem cell therapies to treat glaucoma. Researchers now believe that there is a potential for using stem cells as a renewable source of replacement cells and tissue to treat glaucoma. It is believed that adult stem cells will work by replacing retinal ganglion cells, the cells that die in glaucoma.

A new type of drug is being researched that could help stop or slow vision loss from glaucoma. The new type of drug that is being developed is one that curbs the action of NOS-2, an enzyme that makes nitric oxide. This type of drug has been shown in animals to slow down and possibly prevent the loss of retinal ganglion cells (RGCs), the crucial nerve cells so important to sight.

### **References**

Lesar TS. Glaucoma. In: Pharmacotherapy: a physiologic approach. 4th ed. DiPiro JT,

Talbert RL, Yee GC, et al., eds. Stanford, CT: Appleton & Lange; 1999:1466-78.

Ackerman SJ. Guarding against glaucoma. [resource on World Wide Web]. URL: [http://www.fda.gov/fdac/features/995\\_glaucoma.html](http://www.fda.gov/fdac/features/995_glaucoma.html). Available from the internet. Accessed March 12, 2001.

The Glaucoma Foundation Home Page. [resource on World Wide Web]. URL: <http://www.glaucoma-foundation.org>. Accessed October 3, 2002.

Glaucoma Research Foundation Home Page. [resource on World Wide Web]. URL: <http://www.glaucoma.com>. Accessed October 3, 2002.

*Glaucoma Health Condition Last Updated: December 2003*

---

**Note:** The above information is intended to supplement, not substitute for, the expertise and judgment of your physician, pharmacist, or other healthcare professional. It is not intended to diagnose a health condition, but it can be used as a guide to help you decide if you should seek professional treatment or to help you learn more about your condition once it has been diagnosed.

[Back](#)